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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

YEH, EDITH M

ART UNIT	PAPER NUMBER
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2634

DATE MAILED: 02/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/370,178

Applicant(s)

LI ET AL.

Examiner

Edith M Yeh

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 August 1999.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 August 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 14, 16, 19 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The “normalizing the total probabilities for all of the states” claimed in claims 14, 16, and 19 is not described, specified, or taught in the specification. The “normalizing/normalization/normalize” is only mentioned one page 4 lines 4-5, page 9 lines 20-21, and page 10 line 13, however there is no description in the specification in such a way as to enable one skilled in the art to make and/or use the invention of “normalizing the total probabilities for all of the states”.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 4-5, 8-9, 13, 15, & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoehner (“TCM on Frequency-Selective Fading Channels” a Comparison of Soft-Output Probabilistic Equalizers”, GLOBECOM '90, IEEE, DEC 1990) in view of Belveze et al. (U.S. Patent 6389574 B1).

Art Unit: 2634

Regarding claim 1, Hoeher teaches a modified SOVA (section 3.2) comprising steps of for successive symbol times, for each states of possible states of a trellis, each state being reachable via a plurality of possible paths associated with respective symbol values (Figure 2, page 379 right column lines 1-14): providing at least one vector of probabilities for respective symbol values for reaching the state by summing products of the probability of reaching the state via the respective paths as claimed (equation 13), and providing a probability for each symbol from respective symbol values (page 379, left column, the third and forth lines before equation 14), however ^{Hoeher} does not specify the details of the determining the state probability. Belveze et al. teach a modified SOVA method for determining a probability of reaching the state via each transition path, and a total probability of reaching the state (column 3 lines 15-39). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Belveze et al.'s method in Hoeher's SOVA (Soft-output Viterbi Equalizer) to bring little error probability degradation (column 3 lines 8-12).

Regarding claims 4 & 5, Hoeher teach the symbol values have a plurality of q values in one vector of probabilities (page 379, left column, the last six lines), and least one provides logarithmic probabilities).

Regarding claims 8 & 13, the rejection of claim 1 applies to claim 8. Belveze et al.'s method is for Q -uplet of symbols and Q is an integer at least equal to 1, the q possible transition paths are at least 2.

Regarding claim 9, Hoeher discloses the probability vector provides logarithmic probabilities (page 379, left column, the last 6 lines and equation 15).

Art Unit: 2634

Regarding claim 15, Hoeher teaches a modified SOVA (section 3.2) comprising steps of updating for successive symbol times a vector of logarithmic probability ratios for each state at a respective time, each vector corresponding to a survivor path, each logarithmic probability ratio representing one of the M-ary (Figure 2, page 379, left column, equation 13 to 15), the M-ary includes the binary, however does not specify the details of the determining the state probability and the total probability of reaching the state. Belveze et al. teach a modified SOVA method for determining a probability of reaching the state via each transition path, and a total probability of reaching the state (column 3 lines 15-39), and indicate the Q-uplet of symbols where Q is an integer at least equal to 1, the value "0" or "1". At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Belveze et al.'s method in Hoeher's SOVA (Soft-output Viterbi Equalizer) to bring little error probability degradation (column 3 lines 8-12).

Regarding claim 17, Hoeher discloses an Equalizer in Figure 1, however does not the detail of the decoder shown. Belveze et al. teach a decoder (84 FIG. 7) to carry out the method of 15. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Belveze et al.'s decoder in Hoeher's Equalizer to have a reasonable complexity, and little error probability degradation SOVA decoder (column 3 lines 8-12).

4. Claims 2-3, 6-7, 10-12, 14 & 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoeher ("TCM on Frequency-Selective Fading Channels" a Comparison of Soft-Output Probabilistic Equalizers", GLOBECOM '90, IEEE, DEC 1990) in view of Belveze et al. (U.S.

Art Unit: 2634

Patent 6389574 B1) as applied to claims above, and further in view of Hladik et al. (U.S. Patent 5721745).

Regarding claims 2 & 6, Hoeher does not specify a vector of probability ratios/logarithmic probabilities for the binary values. However Hladik et al. teach probability ratios (column 5 lines 1-7) and logarithmic probabilities (column 5 lines 7-11) for the binary values. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability ratio/ logarithmic probabilities taught by Hladik et al. in Hoeher's method as typical SOVA calculation (column 4 lines 66-67) and to gain computational advantages (column 5 lines 7-8).

Regarding claims 3 & 10, Hoeher does not specify a vector of probability ratios for the q values (as M -ary). However Hladik et al. teach probability ratios (column 4 line 66- column 5 line 7), at the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability ratios taught by Hladik et al. in Hoeher's method in the one vector for each state comprising at least $q-1$ vectors of probability ratios as typical SOVA calculation (column 4 lines 66-67) and to gain computational advantages (column 5 lines 7-8).

Regarding claim 11, Hladin et al. further teach the logarithmic probability ratios (column 4 line 66- column 5 line 15). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability logarithmic probabilities taught by Hladik et al. in Hoeher's method to gain computational advantages (column 5 lines 7-8).

Regarding claim 12, Belveze et al. teach the Q -uplet of symbols where Q is an integer at least equal to 1. When $Q=1$ it is the binary (M -ary where M is 2) wherein $q=2$. The same rejection applied to claim 10 applies to claim 12.

Regarding claim 7, Hladik et al. teach two vectors of probabilities, one for each of the binary values (column 4 lines 11-13, column 5 lines 6-7). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the vectors of probabilities of binary symbols taught by Hladik et al. in Hoeher's method to have more efficient computation.

Regarding claim 14, Hoeher does not teach the normalizing the total probabilities, however Hladik et al. teach the normalizing the total probabilities (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the normalization in Hoeher's method to have better performance and efficient memory usage (column 2 lines 11-14).

Regarding claim 16, Hoeher does not teach the normalizing the probabilities, however Hladik et al. teach the normalization (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the normalization in Hoeher's method to have better performance and efficient memory usage (column 2 lines 11-14).

5. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Belveze et al. (U.S. Patent 6389574 B1) in view of Hladik et al. (U.S. Patent 5721745).

Regarding claim 18, Belveze et al. have all subject matter claimed except specify using logarithmic probabilities. However Hladik et al. teach using logarithmic probabilities (column 4 line 66-column 5 line 14). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use logarithmic probabilities taught by Hladik et al. to gain computation advantages and efficient storage usage (column 5 lines 7-10).

Regarding claim 19, Belveze et al. do not teach the normalizing the probabilities, however Hladik et al. teach the normalization (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the normalization in Belveze et al.'s method to have better performance and efficient memory usage (column 2 lines 11-14).

Regarding claim 20, Belveze et al. disclose a decoder arranged to carry out the method of claim 18 (84 FIG.7).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edith M Yeh whose telephone number is 7033053416. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 7033054714. The fax phone numbers for the organization where this application or proceeding is assigned are 7038729314 for regular communications and 7038729314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 7033054800.

Edith Yeh
February 6, 2003


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